Amendments to the Claims

Please amend claims 1, 12, 14 and 19. The currently pending claims after amendment are listed below.

1. (Currently Amended) A digital data processing device, comprising:

a memory divisible into a plurality of pages, said memory containing a segment table and a page table separate from said segment table, said segment table having a plurality of segment table entries corresponding to respective segments in a first address space, each said segment containing a respective integral number of said pages of said memory, wherein, for at least some said segments, the respective integral number is greater than one, each segment table entry containing pre-fetch data identifying a plurality of sub-units of the corresponding segment as pre-fetch candidates;

at least one processor;

at least one structure for temporarily storing data from said memory in a location more accessible to said processor than said memory is accessible to said processor; and

a pre-fetch engine, said pre-fetch engine performing at least one pre-fetch action, said at least one pre-fetch action comprising pre-fetching selective data with respect to a sub-unit of said plurality of sub-units of a segment from said memory into said at least one structure for temporarily storing data, said pre-fetch engine selecting said selective data for pre-fetching using said pre-fetch data in said segment table.

2. (Original) The digital data processing device of claim 1, wherein said pre-fetch action comprises pre-fetching address translation data with respect to said sub-unit into at least one address translation cache structure.

3. (Original) The digital data processing device of claim 2, wherein said at least one address translation cache structure comprises a translation look-aside buffer.

4. (Original) The digital data processing device of claim 2, wherein said at least one address translation cache structure comprises an effective-to-real address translation table (ERAT).

5. (Original) The digital data processing device of claim 1, wherein said digital data processing device automatically generates said pre-fetch data.

6. (Original) The digital data processing device of claim 5, wherein said pre-fetch data comprises a plurality of up-or-down counters corresponding to respective sub-units of the corresponding segment, each up-or-down counter being incremented on the occurrence of at least one pre-defined event of a first set with respect to the corresponding sub-unit and being decremented on the occurrence of at least one pre-defined event of a second set with respect to the corresponding sub-unit.

7. (Original) The digital data processing device of claim 6,

wherein each said up-or-down counter is incremented if data with respect to the corresponding sub-unit is loaded into a first structure for temporarily storing data, and a data reference is made to said corresponding sub-unit while the data is in said first structure for temporarily storing data; and

wherein each said up-or-down counter is decremented if data with respect to the corresponding sub-unit is loaded into said first structure for temporarily storing data, and no data reference is made to said corresponding sub-unit while the data is in said first structure for temporarily storing data.

8. (Original) The digital data processing device of claim 1, wherein said sub-unit is a page of memory.

9. (Original) The digital data processing device of claim 1, wherein said segment table translates segment identifiers in an effective address space of an executing task to segment identifiers in a global virtual address space, and wherein a page table translates segment identifiers in the global virtual address space to pages in said memory.

10. (Original) The digital data processing device of claim 1, wherein said pre-fetch action is performed responsive to an occurrence of an event of a first type.

11. (Original) The digital data processing device of claim 10, wherein said event of said first type comprises generating a reference to data within the corresponding segment.

12. (Currently Amended) A processor for a digital data processing device, comprising:

an instruction unit determining instruction sequences;

an execution unit ~~execution~~ executing instructions in said instruction sequences;

at least one cache structure for temporarily storing data from a memory of said digital data processing device for use by at least one of said instruction unit and said execution unit;

a pre-fetch engine, said pre-fetch engine performing at least one pre-fetch action, said at least one pre-fetch action comprising pre-fetching selective data with respect to a sub-unit of ~~said~~ a plurality of sub-units of a segment from said memory into said at least one cache structure for temporarily storing data, said pre-fetch engine selecting said selective data for pre-fetching using pre-fetch data associated with respective segments in said memory, said pre-fetch data identifying a plurality of sub-units of a corresponding segment as pre-fetch candidates;

wherein said sub-unit is an integral number of pages of memory.

13. (Original) The processor for a digital data processing device of claim 12, wherein said pre-fetch action comprises pre-fetching address translation data with respect to said sub-unit into at least one address translation cache structure.

14. (Currently Amended) ~~The~~ A processor for a digital data processing device ~~of claim 12~~, comprising:

an instruction unit determining instruction sequences;

an execution unit executing instructions in said instruction sequences;

at least one cache structure for temporarily storing data from a memory of said digital data processing device for use by at least one of said instruction unit and said execution unit;

a pre-fetch engine, said pre-fetch engine performing at least one pre-fetch action, said at least one pre-fetch action comprising pre-fetching selective data with respect to a sub-unit of a plurality of sub-units of a segment from said memory into said at least one cache structure for temporarily storing data, said pre-fetch engine selecting said selective data for pre-fetching using pre-fetch data associated with respective segments in said memory, said pre-fetch data identifying a plurality of sub-units of a corresponding segment as pre-fetch candidates;

wherein said pre-fetch data comprises a plurality of ~~automatically maintainable~~ up-or-down counters corresponding to respective sub-units of the corresponding segment, each up-or-down counter being incremented on the occurrence of at least one pre-defined event of a first set with respect to the corresponding sub-unit and being decremented on the occurrence of at least one pre-defined event of a second set with respect to the corresponding sub-unit.

15. (Original) The processor for a digital data processing device of claim 14,

wherein each said up-or-down counter is incremented if data with respect to the corresponding sub-unit is loaded into a first structure for temporarily storing data, and a data reference is made to said corresponding sub-unit while the data is in said first structure for temporarily storing data; and

wherein each said up-or-down counter is decremented if data with respect to the corresponding sub-unit is loaded into said first structure for temporarily storing data, and no data reference is made to said corresponding sub-unit while the data is in said first structure for temporarily storing data.

16. (Original) The processor for a digital data processing device of claim 12, wherein said sub-unit is a page of memory.

17. (Original) The processor for a digital data processing device of claim 12, wherein said pre-fetch action is performed responsive to an occurrence of an event of a first type.

18. (Original) The processor for a digital data processing device of claim 17, wherein said event of said first type comprises generating a reference to data within the corresponding segment.

19. (Currently Amended) A method for pre-fetching data within a digital data processing device, said digital data processing device having an addressable memory divisible into a plurality of pages, comprising:

associating with each of a plurality of segments of a first address space of said digital data processing device, a respective plurality of sub-units of the corresponding segment, each said sub-unit of the corresponding segment being an integral number of said pages;

determining that a processor has generated a reference to an address within a first segment of said plurality of segments; and

responsive to said determining step, initiating at least one pre-fetch action with respect to said first segment, said at least one pre-fetch action comprising pre-fetching selective data with respect to each sub-unit of the plurality of sub-units associated with said first segment by said associating step.

20. (Original) The method for pre-fetching data of claim 19, wherein said pre-fetch action comprises pre-fetching address translation data with respect to each said sub-unit of the plurality of sub-units associated with said first segment into at least one address translation cache structure.

21. (Original) The method for pre-fetching data of claim 20, wherein said pre-fetch action further comprises pre-fetching at least some data within each of a plurality of said sub-units associated with said first segment responsive to pre-fetching said address translation data.